California Geological Survey - Note 48

Checklist for the Review of Engineering Geology and Seismology Reports for California Public Schools, Hospitals, and Essential Services Buildings
October 2007

Note 48 is used by the California Geological Survey (CGS) to review the geology, seismology, and geologic hazards evaluated in reports that are prepared under California Code of Regulations (CCR), Title 24, California Building Code. CCR Title 24 applies to California Public Schools, Hospitals, Skilled Nursing Facilities, and Essential Services Buildings. The Building Official for public schools is the Division of the State Architect (DSA). Hospitals and Skilled Nursing Facilities in California are under the jurisdiction of the Office of Statewide Health Planning & Development (OSHPD). The California Geological Survey serves under contract with these two state agencies.

Project Name: _____ Location: _____

OSHPD or DSA File #: _____ Reviewed By: _____

Date Reviewed: _____ California Certified Engineering Geologist #: _____

Checklist Item or Topic Within Consulting Report **NA = not applicable NR = not addressed by consultant and therefore not reviewed at this time**	Adequately Described; Satisfactory	Additional Data Needed; Not Satisfactory
Project Location		
1. Site Location Map, Street Address, County Name: Correctly plot site on a 7½-minute USGS quadrangle base-map.		
2. Plot Plan with Exploration Data with Building Footprint: 1 boring or exploration shaft per 5000 ft^2, with minimum of 2 for any one building. Exploratory trench locations.		
3. Site Coordinates: (Latitude & Longitude)		
Engineering Geology/Site Characterization		
4. Regional Geology and Regional Fault Maps: Concise page-sized illustrations with site plotted.		
5. Geologic Map of Site: Detailed (large-scale) geologic map with proper symbols and geologic legend.		
6. Subsurface Geology: Engineering geology description summarized from boreholes or trench logs. Summarize ground water conditions.		
7. Geologic Cross Sections: Two or more detailed geologic sections with pertinent foundations and site grading.		
8. Active Faulting & Coseismic Deformation Across Site: Prepare page-sized extract map of Alquist-Priolo Earthquake Fault Zones and/or any potential fault rupture hazard identified from the Safety Element of the local agency (city or county); show location of fault investigation trenches; 50-foot setbacks perpendicular from fault plane and proposed building footprints.		
9. Geologic Hazard Zones (Liquefaction & Landslides): (*If applicable*) Prepare page-sized extract of CGS official map showing zones of required investigation for liquefaction and landslide, and/or any pertinent geologic map from the Safety Element of the local agency (city or county).		
10. Geotechnical Testing of Representative Samples: Broad suite of appropriate geotechnical tests.		
11. Geologic Consideration of Grading Plans and Foundation Plans: (*If applicable*) Discussion of engineering geologic aspects of excavation/grading/fill activities, foundation and support structures, and deep foundations. Include geologic and geotechnical inspections and problems anticipated during grading. Special design and construction provisions for footings or foundations founded on expansive soils. Consideration of seismic compression of fills; cut/fill differential settlement.		
Seismology & Calculation of Earthquake Ground Motion		
12. Evaluation of Historical Seismicity: Prepare a short description of how historical earthquakes have affected the site.		
13. Mapped Spectral Acceleration Parameters: S_S, S_1. Maps found at http://earthquake.usgs.gov/research/hazmaps/design/ recommended for establishing design values.		
14. Classify the Geologic Subgrade (Site Class): 2007 CBC Table 1613A.5.2 and Section 1613A.5.5.		
15. Site Coefficients and Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameters: F_a, F_v and S_{MS}, S_{M1}.		
16. Design Spectral Acceleration Parameters: S_{DS} and S_{D1}.		

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17. Seismic Design Category: Report if $S_1 > 0.75$.		
18. Deaggregated Seismic Source Parameters: (*If applicable*) Provide modal magnitude (M_w), and modal distance (km) to fault.		
19. Site-Specific Ground Motion Analysis: (*If applicable*) Required for sites where conditions described in 2007 CBC § 1614A.1.2 apply. Provide probabilistic MCE, deterministic MCE and deterministic lower limit, and design response spectra. Justify analytical choices.		
20. Time-Histories of Earthquake Ground Motion: (*If applicable*) Compute target spectra, justify selected earthquake records, scale to target, and show initial and scaled records.		

Liquefaction/Seismic Settlement Analysis

21. Geologic Setting for Occurrence of Seismically Induced Liquefaction: Perform screening analysis to exclude areas where liquefaction investigation not required. ♦ applicable where ground water surface <50 ft. depth; use historical high ground water for calculations. ♦ low-density, non-plastic alluvium, typically *SPT* $(N_1)_{60}$<30.		
22. Liquefaction Calculations: Based on several detailed geologic cross-sections. Provide calculations (no estimates) including all input parameters.		
23. Seismic Settlement of Entire Soil Column: For two or more locations within the site, evaluate both saturated and unsaturated layers of the entire soil column. Provide calculations (no estimates) including all input parameters. Evaluated with peak ground acceleration based on site-specific study or peak ground acceleration equal to $S_{DS}/2.5$.		
24. Potential for Lateral Spreading		
25. Mitigation Options for Liquefaction: Discuss effectiveness of options to mitigate liquefaction effects. Acceptance criteria for ground-improvement schemes.		

Slope Stability Analyses

26. Landslide Mapping: Characterize the potential for landsliding both on and off-site affecting proposed project.		
27. Determination of Static And Dynamic Strength Parameters: Conduct appropriate laboratory tests to determine material strength considering both static and dynamic conditions.		
28. Determination of Pseudo-Static Coefficient (K_{eq}): Recommended procedure available from http://www.scec.org/resources/catalog/hazardmitigation.html.		
29. Identify Critical Slip Surfaces for Static and Dynamic Analyses: Failure surfaces should be modeled to include existing slip surfaces, discontinuities, geologic structure and stratigraphy; include appropriate ground water conditions.		
30. Dynamic Site Conditions: Site response analysis and topographic effects should be considered, if appropriate.		
31. Mitigation Options for Landsliding/Other Slope Failure: Discuss effectiveness of options to mitigate landsliding/slope failure effects. Acceptance criteria for ground-improvement schemes.		

Other Geologic Hazards or Adverse Site Conditions

These exceptional geologic hazards do not occur statewide. However, they may be pertinent to a particular site. Use prudent analysis to avoid predicaments and expensive delays in construction. This list will help to avoid misunderstandings and back-checks when additional information is required by the reviewing agency.

32. Expansive Soils		
33. Corrosive/Reactive Geochemistry of Geologic Subgrade: Soluble sulfates and corrosive soils.		
34. Conditional Geologic Assessment: Including but not limited to - **A. Hazardous materials** (methane gas, hydrogen-sulfide gas, tar seeps); **B. Volcanic eruption**; **C. Flooding** FEMA FIRM's for 100-year flood, is the site protected by a levee; **D. Tsunami and seiche inundation**; **E. Radon-222 gas** (typically within organic-rich marine-shale of the California Coast Ranges); **F. Naturally occurring asbestos** (in geologic formations associated with serpentine; refer to CGS SP 124); **G. Hydrocollapse** of alluvial fan soils due to anthropic use of water; **H. Regional subsidence**; **I. Clays and cyclic softening.**		

Report Documentation

35. Geology, Seismology, and Geotechnical References		
36. Certified Engineering Geologist: (2007 CBC § 1802A.7.2)		
37. Registered Geotechnical Engineer: (2007 CBC § 1802A.8.1)		